DOCUMENT RESUME

ED 265 767 HE 019 010

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TITLE Implementing Microcomputers in Academic Departments: Changing the Face of Academic and Administrative Life at the University of California, Santa Barbara.
PUB DATE 11 Dec 85
NOTE 12p.; Paper presented at the CAUSE National Conference (New Orleans, LA, December 11, 1985).
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *College Faculty; Computer Literacy; *Computer Oriented Programs; Data Processing; Decentralization; Department Heads; *Departments; Higher Education; Management Information Systems; *Microcomputers; Productivity; *Program Implementation; State Universities; Word Processing
IDENTIFIERS *Academic Computing; Research Universities; *University of California Santa Barbara

ABSTRACT

The installation of 275 microcomputers in 34 academic departments over 18 months at the University of California, Santa Barbara, is discussed. This undertaking by the Provost's Office of the College of Letters and Science was designed to enhance faculty productivity by increasing access to computing, and to enhance administrative support to chairpersons and faculty by automating recordkeeping and word processing at the departmental level. The implementation process involved development of a decentralized computing philosophy, the decision to utilize microcomputers, the phased implementation of hardware, and provision of user support services. Attention is also directed to 10 consequences of the implementation that might interest other universities: (1) computer literacy enhanced productivity, (2) standardizing microcomputer hardware throughout the college had both positive and negative outcomes; (3) microcomputers facilitated faculty independence; (4) real-time computing changed expectations; (5) user support was necessary but expensive; (6) microcomputers became status symbols; (7) shared use by faculty was ineffective; (8) centralized computing was adversely affected; (9) interdepartmental communication was improved; and (10) the benefits exceeded the costs. (SW)

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"IMPLEMENTING MICROCOMPUTERS IN ACADEMIC DEPARTMENTS: CHANGING THE FACE OF ACADEMIC AND ADMINISTRATIVE LIFE AT THE UNIVERSITY OF CALIFORNIA, SANTA BARBARA"

1985 CAUSE National Conference Contributed Paper
New Orleans, Louisiana - December 11, 1985

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HE 019 010

Abstract

Descriptive review of how the Provost's Office of the College of Letters and Science at UC Santa Barbara installed 275 microcomputers in 34 academic departments during the past 18 months. The goals of the installation were to 1) enhance faculty productivity by increasing access to computing; and 2) enhance administrative support to chairpersons and faculty by automating recordkeeping and word processing at the departmental level. The paper discusses the process of implementing microcomputers including development of a decentralized computing philosophy, the decision to utilize microcomputers, the phased implementation of hardware, and provision of user support services. The paper also presents ten consequences or observations of the implementation process which should benefit other institutions considering the implementation of microcomputers in academic departments.

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INTRODUCTION

The intent of this paper is to present a descriptive review of how the Provost's Office of the College of Letters and Science at the University of California, Santa Barbara (UCSB) implemented 275 microcomputers in 34 academic departments during the 18 month period from July 1984 through December 1985. Included is a discussion of the process by which the College assessed departmental needs, selected appropriate vendors, planned for phased distribution, installed hardware and software, and handled on-going user support; as well as a discussion of the major consequences accompanying the implementation. The paper refers to both academic computing and administrative computing in academic departments. For purposes of definition, academic computing is viewed as those computing activities undertaken by faculty in support of instruction or research, while administrative computing is viewed as those computing activities undertaken by staff to provide automated logistical support to faculty at the departmental level.

This discussion focuses exclusively on academic departments within a medium-sized public research university, and the process of implementing microcomputers to enhance academic and administrative computing in academic departments. It is beyond the scope of this paper to review the nature of academic departments as unique organizational units within an institutional setting, but it is important to remember that the governance structure and operational aspects of academic departments differ considerably from other non-academic units. Consequently, the experiences of the College of Letters and Science at UCSB are best generalized to large schools and colleges in other universities, and not to other non-academic segments of institutions.

THE PROCESS OF IMPLEMENTING MICROCOMPUTERS

Computing Philosophy of the College

A predominant feature of the University of California system is decentralized decision-making and responsibility, particularly as it pertains to the academic areas of each campus. This emphasis on decentralization began to strongly influence campus computing resources at UCSB around 1980 when it became apparent that the cost of computer hardware was steadily decreasing while the availability of computer hardware was steadily increasing. As noted by John W. McCredie in Campus Computing Strategies (1983), UCSB's experience was not unique in this regard. Universities everywhere were participating in the "new wave" of integrated low-cost computing and communication technologies, as evidenced by the "spread of mini- and microcomputers into every area of higher education" (pg. 4). Moreover, McCredie noted that "the rapid development and spread of microcomputers was accelerating the decentralization of computing resources on campuses" (pg. 8).

The combination of a general decentralized management philosophy for academic units at UCSB coupled with the changing face of computer technology led to a Collegewide policy encouraging decentralized computing. The immediate result was that the Provost's Office assumed broad responsibilities for coordinating academic and administrative computing within the College. Initial efforts included the distribution of stand-alone word processing systems to academic departments in the 1982/83 academic year, and the hiring of an independent consultant to assess the administrative computing needs of academic departments in the Spring of 1983. The distribution of word processing systems was handled in an ad hoc fashion, lacking sufficient coordination, although it did stimulate faculty and staff to think more creatively about computing applications. It was soon apparent that more intensive planning was necessary, and the results of the independent consultant's review of administrative computing needs in a dozen departments underscored this theme. The consultant's review included faculty and staff comments on a wide spectrum of issues, with four factors consistently repeated regarding academic and administrative computing in departments:

Computing Concerns of Academic Departments

1) Increasing demand for low-cost computing

2) Increasing demand for greater access to computing for academic and administrative work

3) Increasing dissatisfaction with existing centralized computing services

4) Increasing interest in minicomputer and microcomputer applications

On the basis of this input from faculty and staff in Letters and Science departments coupled with a realization that centralized mainframe computing services could not satisfy departmental needs, the Provost's Office adopted a formal philosophy encouraging the implementation of stand-alone computing wherever possible. This philosophy was not limited to microcomputers, as a number of departments eventually purchased minicomputers for various instruction and research projects. However, the implementation of minicomputers involved eight machines and is a separate subject beyond the scope of this paper.

The Decision to Use Microcomputers

Behind the decision to emphasize decentralized stand-alone computing for departments was the very real need to rapidly expand the basic computing capacity available to academic departments so as to satisfy two goals: 1) enhance faculty productivity by increasing access to computing; and 2) enhance

administrative support to chairpersons and faculty by automating recordkeeping and word processing at the departmental level. Related to the first goal was a basic belief that increases in faculty computer literacy would ultimately lead to increases in student computer literacy, as faculty would apply their research experiences with computing to the classroom.

With these goals in mind, the College continued to utilize the services of an independent consultant to evaluate stand-alone computing alternatives for administrative computing, and surveyed faculty concerning preferences for academic computing. Provost's Office staff visited five other University of California campuses in the Fall of 1983 to assess comparable approaches to enhancing computing in academic departments. On the basis of combined input from these various sources, the College decided to implement microcomputers because of a number of clear advantages of this technology in addressing the computing needs of 34 Letters and Science departments:

Advantages of Microcomputers for Departments

*Adaptable to large/small environments
*Ease of operation
*Expandable
*Local control of systems
*Low-cost start-up
*Multiple applications and uses
*Networking capabilities
*Portable
*Real-time processing
*Shared use

The next question was to determine which microcomputer to purchase for academic departments. The Provost's Office decision to select International Business Machines, Inc. (IBM) was based on three key factors. First, IBM was a large established company with a proven track record of support for universities plus a stable prospectus for the future. The College had confidence that IBM would still be around five years down the road. Second, the existing and future product development plans for the IBM Personal Computer (PC) provided desired expandability and adaptability without compromising the critical need for standardization. Equipment standardization was viewed as essential in order to promote shared use, simplify installation and maintenance, and streamline software development and training. Moreover, the IBM PC also offered tremendous potential for both academic and administrative uses through varying hardware configurations such as the PC/XT and PC/AT. Third, a very important factor was price. IBM entered into an agreement with the University of California providing substantial purchase discounts, including a 37% price reduction on bulk purchases of 50 or more PC's plus any necessary peripherals and software. In addition, IBM offered loaner equipment through their Educational

Development Program, by which the campus could receive PC's free-of-charge for six months and then purchase some or all of the loaned hardware and software at the end of this period at a 43% price reduction.

Phased Implementation of Microcomputers

The College developed a flexible implementation plan for purchasing, testing, and installing the 275 PC's in the eighteen month period from July 1984 through December 1985. The plan itself did not consist of a single document, but rather was the product of simultaneous efforts aimed at expanding available academic and administrative computing. Hence, there was no specific target number of PC's to be distributed, just the general objective of increasing microcomputing capacity in every department in order to accomplish the following: 1) provide "PC's on Wheels" in each department whereby faculty could share mobile PC's for word processing purposes to aid in preparation of initial drafts of papers, proposals, course materials, correspondence and other items; 2) provide specially configured PC's, PC/XT's, or PC/AT's for faculty to use in data analysis and problem solving in their research or for curriculum development in instruction; and 3) provide improved administrative computing support to faculty at the departmental level through development of an Automated Recordkeeping System to assist with resource management and real-time bookkeeping, plus automation of department office functions such as word processing.

The basic theme underlying these three objectives was to help automate a wide range of tasks previously done manually by both faculty and staff. The first two objectives satisfied instruction and research needs and were classified as academic computing, while the third objective was classified as administrative computing. A survey in November 1985 revealed the following utilization patterns of the 275 PC's for academic and administrative computing:

Utilization of PC's

Purpose	Qty	%
Academic Computing	176	64
Administrative Computing	69	25
Combined Use	30	11
Totals	275	100

Distribution of the PC's was accomplished in three six-month phases: Phase I, July 1984 through December 1984; Phase II, January 1985 through June 1985; and Phase III, July 1985 through December 1985. Distribution by academic department is presented in Table I on page 10, and indicates that 221 or 80% of the microcomputers were PC's, 43 or 16% were PC/XT's, and 11 or 4%

were PC/AT's. The Collegewide distribution by phase is presented below:

Phased Distribution of PC's

Phase	Qty	%
Phase I (7/84 - 12/84)	63	23
Phase II (1/85 - 6/85)	128	47
Phase III (7/85 - 12/85)	84	30
Totals	275	100

The actual purchase of the 275 PC's was handled one of two ways. Either the Provost's Office sponsored the PC purchase (through the IBM Educational Development Program, a bulk purchase arrangement, or as part of the distribution of administrative computing systems) or the department purchased the PC (using allocated equipment funds, extramural contract and grant funds, or overhead funds). The Provost's Office directly purchased 192 PC's or 69% of the total, including 55 loaner PC's as part of IBM's Educational Development Program, and departments directly purchased 83 PC's or 31% of the total.

Providing User Support Services

In order to help administer the distribution of PC's to departments, as well as to consult on hardware and software and implement appropriate administrative systems, the Provost's Office created a support staff group entitled Administrative Computing Services (ACS). By the fall of 1985, ACS had evolved into a cohesive unit of five full-time data processing professionals providing user support services to academic departments. Three staff were charged with the task of developing and maintaining a series of Automated Resource Management Systems throughout the College, including various automated recordkeeping modules (accounting system, recharge system, storeroom inventory control system), faculty and staff provision control systems, and budget tracking systems. The remaining two staff were responsible for direct user support including selection, testing and installation of hardware and software, coordinating insurance coverage, providing user training, evaluating peripherals and software, and negotiating maintenance agreements.

ACS staff remain active in administrative systems development for Letters and Science departments using programming languages such as COBOL, D-BASEIII, FOCUS, and PASCAL. ACS staff maintain a working knowledge of Displaywrite III, Microsoft Word, Word Perfect, and Word Star, so as to help advise and train faculty and staff interested in using word processing software. They have also negotiated a low-cost maintenance agreement for the College with Computerland. By conducting an initial diagnostic

evaluation and arranging for a single pick-up location for PC's in need of repair, per hour maintenance costs were considerably less than those offered by other vendors, including IBM.

ACS functioned strictly in a support capacity vis-a-vis departments, with an agenda dictated by departmental needs as articulated by faculty and staff. Choices between competing needs, particularly in the area of administrative systems development, were made by the Provost in consultation with departments. ACS staff responded to problems and inquiries within the established limitations requiring standardization in hardware and software. Fortunately, there was considerable flexibility in attempting to respond to departmental needs, since most software products were IBM PC compatible, and most applications could operate on an IBM PC, PC/XT, or PC/AT.

CONSEQUENCES OF IMPLEMENTING MICROCOMPUTERS

As with any significant organizational change, the mass distribution of such a large number of microcomputers in a relatively short time span impacted departmental lifestyles. A number of unforeseen consequences occurred, although the overall reaction of faculty and staff across disciplines was generally favorable. Below is a review of the more significant consequences which might be relevant to other institutions seeking to implement microcomputers in academic departments. The order does not reflect any ranking or level of significance.

Computer Literacy Enhanced Productivity

A very positive outcome from the distribution of microcomputers was a marked increase in productivity by both faculty and staff in departments. Faculty using PC's for initial preparation of text and proposals were enthusiastic about the gains in their personal productivity as writing is easier and quicker. Staff using PC's for recordkeeping and word processing found they accomplished more in less time, and that revisions and updates did not create the emotional turmoil that once seriously impacted clerical staff morale. Faculty also found that their ability to experiment with computing for various instructional and research purposes was enhanced through microcomputers due to reduced costs and ease of operation.

Standardization Was A Two-Edged Sword

The decision to standardize microcomputer hardware throughout the College was basically a mixed blessing. On the one hand, standardization was a positive factor in simplifying testing, installation, and maintenance of hardware, and in streamlining software development and training. This was especially true in administrative systems development, where staff user groups were formed to help design initial systems and to facilitate training. On the other hand, standardization was a negative factor to many

faculty because it was limiting. Faculty were generally accustomed to freedom of choice, and there was some resistance to distribution of a single product. Some faculty were reluctant to learn a new system if they had used different hardware or software before, others mistrusted IBM and questioned its corporate motives, while still others expressed considerable computer expertise (both real and imaginary) and complained that the IBM PC was improperly suited for their work. Ultimately, these faculty concerns really reflected a broader interest in control over academic decision making, especially in areas of new technology with such enormous potential for changing the academic workplace.

PC's Facilitated Faculty Independence

The advantages of microcomputers, as previously discussed, afforded a form of technology best-suited to faculty behavior because of features such as portability, expandability, and a stand-alone operating system. In essence, the PC represented a technological extension in computing of how faculty view themselves within the academic organization: decentralized and fully independent. Hence, PC's facilitated the natural independence and creativity of faculty in conducting their teaching and research.

Real-Time Computing Changed Expectations

A fundamental change brought about by the implementation of microcomputers into academic departments was the advent of real-time computing. The presence of real-time computing altered the demands for information and faculty expectations of turn-around time on work assignments. Staff who previously functioned simply as clerks or secretaries found themselves being asked more questions and given more work. In administrative computing systems, staff had access to real-time financial and personnel data so as to better serve faculty needs. While some staff reacted to this change with great enthusiasm, others were threatened and confused by the loss of a "time lag" in the preparation and recording of transactions. Suddenly, errors were handled by official correcting entries into systems, instead of merely being erased or replaced as with manual or batch systems.

User Support Was Necessary But Expensive

Not surprisingly, quality user support was necessary for the mass distribution of microcomputers to be successful. Without the presence of full-time ACS staff to oversee ordering, testing, installation, maintenance, and training activities, the mass distribution of PC's would have been unsuccessful. Moreover, ACS staff maintained cooperative working relationships with a variety of faculty and staff (all with differing levels of computer expertise) and responded well to the difficult task of advocating certain solutions to microcomputer problems while leaving the

actual decision making up to individual users. Quality user support was also quite expensive because it was so labor intensive. Each new installation added a multiplier effect to user support costs which were often unaffected by economies of scale. Although standardization and mass distribution had the advantage of reducing hardware acquisition costs and fostering lower group rates for maintenance and insurance, it had the disadvantage of increasing personnel costs due to the need for one-on-one consultation and user training. User support became even more expensive when administrative systems software was developed and required maintenance and periodic updating.

PC's Became Status Symbols

A completely unforeseen consequence of the phased distribution of PC's was that the College created a new "status symbol" for faculty and staff. While the Provost's Office believed that the distribution would more than satisfy demand, in reality it established a new measure of institutional prestige. Everyone wanted their own PC on their desk in their office. Faculty and staff with PC's had new stature; those without PC's did not. The result was a predictable outcome from the laws of economics: PC's became highly valued and scarce, hence demand for PC's increased dramatically. With roughly 530 permanent tenure-track faculty, 140 temporary faculty, and 250 permanent staff in Letters and Science departments, a very large (but perhaps artificial) demand remains for PC's.

Shared Use By Faculty Was Ineffective

Related to the creation of the PC as a "status symbol" was the failure of the "PC's on Wheels" approach to work effectively in departments. The assumption that faculty would share the use of PC's ignored a basic principle of human behavior: "possession is nine-tenths of the law". The idea of implementing mobile PC's was a well-intentioned attempt to recognize that faculty prefer to work in their offices (at all hours of the day and night) rather than to share a microcomputer facility within the department. However, once individual faculty moved a shared PC to their office, it usually became their PC and was not available for use elsewhere. The few departments that established a microcomputer room to house their PC's fared better with shared use since faculty and staff could only use the hardware and software in a single location. Complications over shared use also occurred with printers. The College had planned to provide one printer for every six mobile PC's, but 108 printers have been distributed for the 275 PC's, creating a ratio of one printer for every three PC's, or twice as many as originally anticipated.

Centralized Computing Was Adversely Affected

Although it is not the focus of this paper to review the pros and cons of centralized computing services, the decentralized

computing philosophy of the College and the decision to implement microcomputers in academic departments impacted the centralized computing services at UCSB in a number of significant ways. First, the costs of central mainframe computing continued to increase as academics redirected their computing business to departmental minicomputers and microcomputers. The fixed costs of centralized computing remained constant even though the number of users declined. Second, central computing services evolved into basically an administrative computing center concerned with large systems such as payroll and student registration. Hence, central computing staff were not as actively involved in mainstream activities and developments with academic computing. Third, adversarial feelings emerged on campus between those advocating mainframe computing versus those advocating microcomputing. However, the real issue was not technology-centered, but resource-centered. The distribution of PC's represented part of the continuing decentralization of resources and computing business away from a single centralized mainframe computing service.

Interdepartmental Communication Was Improved

A small but clearly tangible consequence of implementing such a large number of PC's was improved communications and a closer working relationship between the Provost's Office and departments, as well as between departments themselves. There was greater understanding of shared needs and problems, and departments consistently voiced a belief that the Provost's Office placed departmental computing needs first and advocated for solutions to those needs. Departments also actively sought advice and counsel from other departments on computing and other issues, which was a positive change from only a few years ago.

The Benefits Exceeded the Costs

Lastly, in evaluating the experience of the College of Letters and Science at UCSB with implementing 275 IBM PC's in 34 academic departments, it was clear that the benefits exceeded the costs. The phased distribution of microcomputers accomplished the goals it was intended to accomplish: 1) faculty productivity was enhanced through increased access to computing; and 2) administrative support to faculty at the departmental level was enhanced by automating recordkeeping and word processing. No other computing approach could have reached so many individuals in such a short period of time with such positive results. This is not to diminish the problems or unforeseen consequences, but rather acknowledges the general success of the phased distribution from an overall perspective. It also recognizes that the idea was not to avoid costs, but to dramatically enhance computing capacity at the operational level in an academic department.

TABLE I

DISTRIBUTION OF IBM PERSONAL COMPUTERS BY ACADEMIC DEPARTMENT

COLLEGE OF LETTERS AND SCIENCE - UC SANTA BARBARA

DEPARTMENT	PC	PC/XT	PC/AT	TOTAL	%
Anthropology	8	1	1	10	3.6
Art History	2	0	0	2	0.7
Art Museum	0	0	0	0	0.0
Art Studio	2	0	0	2	0.7
Biological Sciences	27	2	1	30	10.9
Black Studies	2	0	0	2	0.7
Chemistry	6	3	0	9	3.3
Chicano Studies	2	0	0	2	0.7
Classics	3	0	0	3	1.1
Communications Studies	6	1	0	7	2.5
Dramatic Art	3	1	0	4	1.5
Economics	9	3	3	15	5.5
English	12	2	0	14	5.1
Environmental Studies	6	2	0	8	2.9
Film Studies	1	0	0	1	0.4
French/Italian	8	0	0	8	2.9
Geography	4	6	2	12	4.4
Geological Sciences	13	2	1	16	5.8
German/Slavic	8	1	0	9	3.3
History	11	0	0	11	4.0
Linguistics	3	0	0	3	1.1
Mathematics	2	1	0	3	1.1
Military Science	1	0	0	1	0.4
Music	2	1	0	3	1.1
Philosophy	7	0	0	7	2.5
Physics	7	5	0	12	4.4
Political Science	9	2	0	11	4.0
Psychology	16	2	1	19	6.9
Religious Studies	6	0	0	6	2.2
Sociology	18	5	2	25	9.1
Spanish/Portuguese	8	0	0	8	2.9
Speech	8	0	0	8	2.9
Statistics	0	2	0	2	0.7
Vivarium	1	1	0	2	0.7
TOTALS	221	43	11	275	100.0

-Totals reflect Personal Computers distributed from July 1, 1984 through December 1, 1985.
-Distribution Percentages: PCs - 80%, XTs - 16%, ATs - 4%.